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PRODUCTION OF EXTRACTED CACAO LIQUID, CACAO EXTRACT OR FOOD CONTAINING THE SAME

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[Translator's note: Amendment is incorporated into the main text.]

[Scope of the Claims] /*

[Claim 1] A method of producing an extracted cacao solution characterized in that the process for producing the solution, wherein after selection of whole grains of cacao beans, the unroasted whole grains are crushed by a crushing roll, the crude crushed cacao beans containing shells and germs are treated with an alkali and subsequently water is added for thermal extraction followed by centrifugal separation and filtration, comprises

(a) crushed whole grains of cacao beans used as a raw material,

(b) an alkali agent added such that pH of the extracted cacao solution obtained after alkali treatment is adjusted to a range from 6.5 to 8.0 and

(c) water added to the crushed whole grains of cacao beans to carry out thermal extraction under the condition of 85 to 120°C.

[Claim 2] The method of producing an extracted cacao solution as in Claim 1, wherein in the process of producing the solution, the extracted solution is separated by centrifugal separation after extraction and filtered through a filter paper or a propylene unwoven fabric to obtain an extracted solution essentially containing no oil or fat contents.

[Claim 3] A method of producing an extracted cacao solution characterized in that the extracted cacao solution obtained by the method described in Claim 1 or Claim 2 is treated by an ordinary drying method.

[Claim 4] A method of producing a food characterized in that the food comprises the extracted cacao solution produced by the method described in Claim 1 or Claim 2, its concentrate or the extracted cacao solution

* Claim and paragraph numbers correspond to those in the foreign text.

produced by the method described in Claim 3 as a part of the raw material for compositions.

[Detailed Description of the Invention]

[0001] [Technical Field of the Invention]

The present invention relates to a method of producing an extracted cacao solution using unroasted whole grain cacao beans.

[0002] [Prior Art]

In the production of chocolate and cocoa, cacao beans that have been fermented and dried at the origin of the product are imported and cacao nibs (germs), in which external shells and germs are removed after roasting, are used. The reason for this is that if external shells and germs are present, the resultant chocolate gives a rough feel when eaten and in the case of cocoa, due to high specific gravity of the external shells and germs, precipitation becomes faster while drinking so that it lacks adaptability as a drink. In addition, roasting cacao beans is performed in order to generate the unique flavor of chocolate and cocoa. Typically, when producing cocoa, in order to enhance the cocoa flavor and cocoa color, an alkali treatment is applied after roasting the cacao beans. A general method of cocoa production comprises the following various stages: selection of cacao beans, roasting, crushing, selection of peeling shells, alkali treatment, suction of cacao butter, crushing cocoa cake and pulverization. As shown in the production method, since cocoa contains both the water-soluble and water-insoluble components of the cacao nib, the particles have a size that can be felt as roughness on the tongue after pulverization. Therefore, when consumed as a drink, a powdery texture may

be felt. Although cocoa has a unique flavor which is different from the flavor of chocolate, cocoa drinks are very much loved and development of drinks with a chocolate flavor has been investigated.

[0003] In order to improve the powdery texture of the cocoa drinks or in order to develop drinks having more chocolate flavor than cocoa, using cacao nib, cacao mass or cocoa powder as a starting material, a technology for developing chocolate-flavored chocolate drinks has been explored. For example, the following methods were proposed:

(1) a method for producing a transparent cocoa drink wherein after the enzymatic treatment of the cocoa powder, a purification treatment is applied by an alkali treatment followed by an acid treatment (Japanese Patent No. S52-12269),

(2) a method of extraction for separation of components containing both a water-soluble portion and a portion of micro particles using hot water containing or not containing ethanol from cacao mass or cocoa powder treated with an alkali after being roasted, or a method of extraction of separate components containing both a water-soluble portion and a portion of micro particles by an alkali treatment of cacao mass or cocoa powder using hot water containing an alkali agent containing or not containing ethanol (Japanese Patent No. H1-42657),

(3) a method of obtaining a soluble cocoa wherein the cocoa powder is initially extracted with ethanol and after an enzymatic treatment for a part of the residue, extraction with water is carried out (JP-A (Tokkai) H3-27250),

(4) a method of producing a cocoa extract wherein warm water flows

over the crushed cocoa seed (cocoa nib) in numerous fixed beds and further the extraction solution obtained using warm water is moved in an alternately distributed manner through each fixed bed such that the extraction solution is concentrated (JP-A (Tokkai) H3-94640), and

(5) a method wherein a chocolate drink having a light texture and a rich chocolate-like flavor when drinking is provided by an enzymatic treatment when cacao mass or cacao nib is extracted by adding water after roasting (JP-A (Tokkai) H7-79749).

[0004] On the other hand, as a technology for obtaining cocoa analogs from cacao beans, (6) a method of producing a cocoa raw material was proposed (Japanese Patent No. 56-28497 and Japanese Patent No. 56-28498) wherein bitterness is removed from the roasted cacao beans containing shells and the beans are aged and instantaneously frozen under liquid nitrogen, with or without squeezing the oil, and then micro particles are formed under a low temperature atmosphere.

[0005] As mentioned above, in the prior art for producing cocoa, cocoa-like products or cocoa extracts, roasted cacao beans are mostly used as a raw material. The only case when using unroasted cacao beans was listed as a reference document (German Patent Application Disclosure No. 2,342,177) in said method (4). In this reference document, although unroasted cacao nib was used, the cacao nib did not contain shells or germs, and an alkali treatment was not applied to the cacao nib.

[0006] [Problems to be Solved by the Invention]

The present invention relates to a method of producing a cacao extract from cacao beans. Specifically, it relates to a method of economically

producing a cacao extract having an excellent cacao flavor without containing oils and fats using the shells and germs of cacao beans that have been discarded in the past and that have occupied about 13% of the entire cacao bean particles, without discarding along with the cacao nib.

[0007] When producing chocolate and cocoa, typically shells and germs that occupy approximately 13% of the whole cacao beans (Yoshitsugu Nakanishi, et al.: "Theory and Practice of Manufacturing Chocolate and Cocoa", Korin Shorin, pp. 95) are discarded as waste matter since chocolate gives a taste of roughness if shells and germs are included as mentioned above, and cocoa is rapidly precipitated while being drunk due to high specific gravity of shells and germs resulting in a lack of adaptability as a drink. However, when producing a cacao extract, the extract does not contain an insoluble material originating from cacao beans that cause a rough taste since it is an extract, so the presence of shells and germs in the raw material (non-extracted matter) is not a problem. When producing a cacao extract, the non-extracted matter must be discarded. If shells and germs that occupy approximately 13% of the whole cacao beans must be discarded prior to extraction, it has a great impact on the yield of extraction. Therefore, if shells and germs can be used effectively, it is considered economically advantageous.

[0008] Besides the problems with roughness and powdery texture when producing said chocolate and cocoa, if the shells and germs of cacao beans are used, the problem is that miscellaneous tastes, including a bitter taste attributed to these items, must be removed. In order to solve this problem, in said reference document (6) (JP-B (Tokko) S56-28497 and JP-B

(Tokko) S56-28498), the bitter taste is removed by adsorbing an alcohol or a protein modifier on the surface of the raw materials to be aged. However, according to this method, an alcohol or protein modifier must be provided, making the process much more complex and requiring a long maturation time (15 to 24 hours), resulting in an economical problem. Thus, a much simpler economical method for removing bitterness is requested.

[0009] On the other hand, in the cacao drinks using cacao extract obtained from the conventional roasted cacao nib, the problems are that it is difficult to prevent contamination of oils and fats in the extract due to large quantities of oils and fats in the cacao nib, but to carry out a strict separation of oils and fats makes the production process very complex or that an emulsifier must be added to the cacao drink in order to prevent oils and fats present as impurities from being separated.

[0010] [Means for Solving the Problems]

The inventors earnestly investigated the aforementioned problem, namely the problem when using cacao beans without discarding shells and germs, specifically in an attempt to establish a method of removing miscellaneous taste and a method of preventing contamination of oils and fats, and the present invention was achieved. The present invention will be explained in detail below.

[0011] As was mentioned in the section in “Prior Art”, all raw materials are roasted regardless of the fact that the conventional cacao product is chocolate, cocoa, chocolate drinks, fertilizers or feeds and also regardless of the facts that only cacao nib is used or whether cacao nib

containing shells and germs is used or whether only shells or germs are used. However, in Reference Document (4) described in “Prior Art”, a cocoa extract is obtained from cacao nib, but there is no description whether or not the cacao nib is roasted. It is feasible to determine that they are roasted based on the description “2% moisture content”.

[0012] The inventors aimed at the fact that the theobromine content, which is considered one of the causative materials of the bitter taste of the shell of cacao, is relatively lower when compared to cacao nib and assumed that the bitter taste of shells and germs can be removed without using an alcohol or a protein modifier. While further advancing the investigation, the following method was invented.

[0013] Initially, after the whole cacao beans are imported after fermentation and drying, they are selected and coarsely crushed with crushing rolls without being roasted. The cacao bean crushed matter containing shells and germs of the whole cacao beans is defined as a whole cacao bean crushed matter.

[0014] Subsequently, an alkali agent such as 30 to 70 wt% of potassium carbonate is added to the unroasted whole cacao bean crushed matter (an amount of an alkali agent to be added is adjusted such that a pH value of the extract after the alkali treatment ranges from 6.5 to 8.0). After thoroughly blending the mixture, the reaction/drying process is carried out at 90 to 110°C for 1 to 4 hours. If the pH value is less than 6.5, the reaction is insufficient. If the pH value exceeds 8.0, an irritable odor due to the alkali agent becomes too strong. If the reaction time is less than 1 hour at 90°C, the reaction/drying is insufficient, while if it

exceeds 4 hours or if it exceeds 110°C, one can detect a burnt smell and it is disadvantageous from the economical aspect.

[0015] After drying, water or warm water is added in an amount of 3 to 20 folds to the whole cacao bean crushed matter that has been treated with an alkali and extracted at 85 to 120°C. If the temperature is 100°C or less, extraction is carried out for 15 to 30 min. using a typical open type extractor. If the temperature exceeds 100°C, extraction is carried out for 10 to 20 min. using a typical closed type extractor. Extraction at 100°C or less for less than 15 min. or at a temperature exceeding 100°C for less than 10 min. is inadequate. Extraction at 100°C or less for more than 30 min. or at a temperature exceeding 100°C for more than 20 min. is a waste of energy since no increase in the extraction efficiency is detected. Further, with water in an amount of 3 folds or less, the water is not dispersed uniformly throughout the entire whole cacao bean crushed matter, making the treatment not uniform, which is inappropriate. In contrast, with water in an amount exceeding 20 folds, a large-sized extractor is required, which is economically disadvantageous and an increase in the extraction efficiency is not detected.

[0017] After extraction, an extract is obtained by solid/liquid separation by centrifugal separation, filtration and the like. During centrifugal separation, in order to remove micro insoluble material, oils and fats, it is preferably performed under these conditions: 25°C or less and 9000G or greater. At a temperature exceeding 25°C, the liquid oils and fats portion is not sufficiently solidified so that contamination by oils

and fats in the extract increases, which is not desirable. The content of oils and fats in the extract can be almost removed by centrifugal separation. In order to further remove the content of oils and fats completely, the extract is filtered using a filter paper (e.g., Kimwipes: Jujo Kimberly K.K.) and a propylene unwoven fabric (e.g., Kimracks: Jujo Kimberly K.K.).

[0018] The cacao extract obtained by the aforementioned treatment is used directly after adjusting the pH appropriately, as a concentrated solution or as a powder obtained by typical drying methods such as spray drying or freeze drying. This extract presents a straight cacao flavor without detecting miscellaneous flavors such as bitterness and astringent-taste, a burnt smell or alkaline smell. In this case, the defatted whole cacao bean crushed matter can be used and an oil-free extract can be obtained by similar operations, but in this case, the operation of removing oils and fats is not necessary.

[0019] The aforementioned alkali treatment is not very different from the typical treatment. In this case, it is important to use unroasted whole cacao bean crushed matter as a raw material. Namely, in the case when using the roasted whole cacao bean crushed matter as a raw material, a unique chocolate-flavored or cocoa-flavored cacao extract can be obtained, whereas a straight cacao-flavored extract without said burnt smell, as in the case when using the unroasted whole cacao bean crushed matter as a raw material, cannot be obtained. The cellular tissue of cacao beans is destroyed by roasting so that oils and fats are liberated from the cellular walls as well as an oil-soluble taste providing substance is dissolved in

the extract along with the oils and fats during extraction, which seems to contribute to the unique chocolate flavor or cocoa-flavor. On the other hand, in the case when using unroasted whole cacao bean crushed matter, oils and fats are not liberated from the cellular wall due to light destruction of the cacao cells since no roasting is performed and less contamination of the extract by oils and fats. In addition, extraction of the components resulting in miscellaneous taste is less, so straight cacao-flavor can be obtained.

[0020] [Mode of Carrying out the Invention]

The whole cacao beans after fermentation and drying are dried directly without roasting or a 30 to 70 wt% alkali agent is added to the whole cacao crushed matter (an amount of alkali agent added is adjusted such that pH of the following extract ranges from 6.5 to 8.0) and reaction/drying is carried out at 90 to 110°C for 1 to 4 hours. After drying, water in an amount of 3 to 20 folds is added and extraction is carried out at 85 to 120°C for 10 to 30 min to obtain an extract. An insoluble component, oils and fats are removed from the extract by centrifugal separation and filtration to obtain an extracted cacao solution. After adjusting the pH, the extract, its concentrate or a powder dried by spray drying is directly used as a raw material of drinks and confectioneries. The details of the embodiments will be described below in “Embodiments”.

[0021] [Embodiments]

Embodiment 1

Unroasted cacao beans were crushed using crushing rolls and the cacao bean crushed matter 100 g, without removing the shells and germs, was added

to an alkali solution (70 ml) prepared by dissolving 1 g of sodium hydroxide and 1 g of potassium carbonate. After thoroughly blending, the reaction was carried out at 105°C and dried. At the end of drying, 500 ml of water was added and hot extraction was carried out at 120°C for 10 min. in a pressure container. After extraction, the extract was filtered through gauze to remove insoluble coarse particles. The filtrate was separated by centrifugal separation under these conditions: 10°C, 12000GG for 15 minutes in order to remove insoluble oils and fats. Finally, after adjusting the pH to 6.8, about 300 ml extracted cacao solution was obtained.

Embodiment 2

5 kg of the unroasted cacao bean crushed matter obtained, as in Embodiment 1, was placed in a 100 liter boiling reactor equipped with a stirrer and an alkali solution (2 L) prepared by dissolving 75 g of sodium carbonate, and 25 g of potassium carbonate was also added. After thoroughly blending, a lid was placed on the reactor and the reaction was heated using steam. After 30 minutes from the point the product temperature exceeded 90°C, the lid of the reactor was opened and the content was dried while stirring. After the end of drying, 50 liter of water was added and extracted by hot extraction at 90 to 95°C for 30 minutes. After the extraction, the extract was filtered through a nylon mesh to remove insoluble coarse particles. The filtrate obtained was separated by continuous centrifugal separation under the conditions: 20°C and 9500G in order to remove fine insoluble substances and oil and fat content. Further, the separated solution was filtered using a Kimtex (a propylene

unwoven fabric by Jujo Kimberly K.K.) and finally the pH was adjusted to 6.8 to obtain 33 liters of an extract containing no insoluble substances or oil and fat content. Quartz sand was added to 100 ml of the extract and the extract was evaporated to dryness over a warm water bath. The dried matter was placed in a cylindrical filter paper and fats were extracted using ether in a Soxhlet extractor to quantitatively measure the crude fat content. However, no crude fat was detected. 5 liters of the extract obtained was concentrated by 4 folds to obtain 1.2 liters of the concentrated cacao extract. Furthermore, 4 x concentrated solution (1 liter) was freeze-dried to obtain cacao extract in a dried powder (81 g).

Comparative Example 1

After cacao beans were roasted by the ordinary method, the beans were crushed using crushing rolls and the cacao nib was obtained by removing shells and germs by air selection. This cacao nib 100 g was treated by the same method as in Embodiment 1 and finally the pH was adjusted to 6.8 to obtain about 320 ml of a cacao extract.

Comparative Example 2

After cacao beans were roasted by the ordinary method, the beans were crushed using crushing rolls and the cacao nib was obtained by removing shells and germs by air selection. This cacao nib 5 kg was treated by the same method as in Embodiment 2 and finally the pH was adjusted to 6.8 to obtain about 35 liters of an extract solution free of insoluble substances and oil and fat content.

Test Example 1

Each cacao extract obtained in Embodiment 1 and Comparative Example

1 was diluted in Brix 1 in 1000 parts and combined with 70 parts of sugar, 10 parts of whole powder milk, 1 part of salt, 1.5 parts of sugar ester and 0.5 parts of spices and blended by the ordinary method while heating. After being dissolved, the mixture was packed in a can and sealed followed by retort pasteurization to obtain a chocolate drink. The chocolate drink obtained from the extracted cacao solution in Embodiment 1 and the chocolate drink obtained from the extracted cacao solution in Comparative Example 1 were compared for flavor in the functional test using 50 special panelists. The results are shown in Table 1. Although no significant differences were determined between the two groups in terms of superiority/inferiority of the flavor, as a characteristic flavor, the chocolate drink prepared in Embodiment 1 demonstrated a straight fresh flavor without a feel of any miscellaneous tastes such as burnt smell, bitter taste or the like.

[Table 1]

Chocolate drink	Number of panelists who determined as a desirable flavor when comparing between Embodiment 1 and Comparative Example 1 (/50 panelists)	Characteristics of flavor	
		Number of panelists who determined to feel miscellaneous tastes such as burnt smell (/50 panelists)	Number of panelists who determined as a straight and refreshing flavor (/50 panelists)
Embodiment 1	27 panelists [a)]	3 panelists [c)]	33 panelists [e)]
Comparative Example 1	23 panelists [b)]	14 panelists [d)]	19 panelists [f)]

[a)b)] No significant differences regarding the decision that Embodiment 1 is more desirable than Comparative Example 1.

[c)d)] Regarding Embodiment 1 and Comparative Example 1, significant differences were found regarding the decision whether miscellaneous tastes, such as burnt smell, were not detected.

[e)] Regarding Embodiment 1, a significant difference was detected for the decision that a straight refreshing flavor was detected.

[f)] Regarding Comparative Example 1, a significant difference was not

detected for the decision that a straight refreshing flavor was detected.

Test Example 2

Each cacao extract obtained in Embodiment 2 and Comparative Example 2 was diluted in Brix 1 in 1000 parts and combined with 70 parts of sugar, 10 parts of whole powder milk, 1 part of salt, 1.5 parts of sugar ester and 0.5 parts of spices and blended by the ordinary method while heating. After being dissolved, the mixture was packed in a can and sealed followed by retort pasteurization to obtain a chocolate drink. The chocolate drink obtained from the extracted cacao solution in Embodiment 2 and the chocolate drink obtained from the extracted cacao solution in Comparative Example 2 were compared for the flavor in the functional test using 50 special panelists. The results are shown in Table 2. Although no significant differences were determined between the two groups in terms of superiority/inferiority of the flavor, as a characteristic flavor, the chocolate drink prepared in Embodiment 2 demonstrated a straight fresh flavor without a feel of any miscellaneous tastes such as burnt smell, bitter taste or the like.

[Table 2]

Chocolate drink	Number of panelists who determined as a desirable flavor when comparing between Embodiment 2 and Comparative Example 2 (/50 panelists)	Characteristics of flavor	
		Number of panelists who determined to feel miscellaneous tastes such as burnt smell (/50 panelists)	Number of panelists who determined as a straight and refreshing flavor (/50 panelists)
Embodiment 2	26 panelists [a)]	7 panelists [c)]	37 panelists [e)]
Comparative Example 2	24 panelists [b)]	16 panelists [d)]	23 panelists [f)]

[a)b)] No significant differences regarding the decision that Embodiment 2 is more desirable than Comparative Example 2.

[c)d)] Regarding Embodiment 2 and Comparative Example 2, significant differences were found regarding the decision whether miscellaneous tastes, such as burnt smell, were not detected.

[e)] Regarding Embodiment 2, a significant difference was detected for the decision that a straight refreshing flavor was detected.

[f)] Regarding Comparative Example 2, a significant difference was not detected for the decision that a straight refreshing flavor was detected.

Embodiment 3

Using the extracted cacao solution obtained in Embodiment 1, a chocolate ice candy was prepared by the ordinary method with the composition shown in Table 3.

[Table 3] Chocolate Ice Candy Mix

Sugar	100	Parts by weight
Millet jelly	30	Parts by weight
Isomerized sugars	50	Parts by weight
Extracted cacao solution	120	Parts by weight
Stabilizer	3	Parts by weight
Water	880	Parts by weight
Spices	1.2	Parts by weight

An ice candy with a refreshing feel was obtained.

Embodiment 4

Diluting the extracted cacao solution (Brix 2.2) obtained in embodiment 2 and after adjusting to pH 6.8, a transparent cacao drink was prepared by the ordinary method with the composition shown in Table 4.

[Table 4] Cacao Drink Mix

Extracted cacao solution	1000	Parts by weight
Sugar	55	Parts by weight
Spices	0.5	Parts by weight

A refreshing cacao drink containing no insoluble substances or oil and fat content was obtained.

Embodiment 5

Using the cacao extract powder obtained in Embodiment 2, a chocolate jelly was prepared by the ordinary method with the composition shown in Table 5.

[Table 5] Chocolate Jelly Mix

Morinaga Cooking Gelatin[a]	10	Parts by weight
Sugar	50	Parts by weight
Extracted cacao solution	5	Parts by weight
Spices	0.28	Parts by weight
Water	500	Parts by weight

[a]: Gelatin powder by Morinaga & Co

A transparent chocolate jelly with a refreshing feel not containing oil and fat content was obtained.